

AMENDMENTS TO THE CLAIMS

Please amend the claims as indicated in the following listing of all claims:

1. (Currently amended) A method of profiling code for an execution environment in which latency exists between an execution event and detection thereof, the method comprising:
 - executing the code on a processor;
 - detecting the execution event; and
 - backtracking a displacement from a detection point in the code coinciding with the detection of the execution event to a preceding operation, wherein the displacement is based, at least in part, on a type of operation appropriate to have triggered the execution event associated with the execution event, the backtracking identifying the preceding operation at a predetermined displacement from the detection point.
2. (Cancelled)
3. (Currently Amended) The method of claim 1 [[2]] further comprising, if an ambiguity creating location is encountered while backtracking, either ignoring the execution event or bridging wherein the ambiguity creating location is bridged using branch history information.
4. (Cancelled)
5. (Currently Amended) The method of claim 1, wherein the ambiguity creating location is one of:
 - a jump target location;
 - an indirect branch target location;
 - a branch target location;
 - entry point location;
 - a trap handler location; and
 - an interrupt handler location.

6. (Original) The method of claim 1,
wherein the preceding operation corresponds to a load instruction; and
wherein the execution event is a cache miss.
7. (Original) The method of claim 1,
wherein the preceding operation corresponds to a memory access instruction; and
wherein the execution event is either a hit or a miss at a level in a memory hierarchy.
8. (Previously Presented) The method of claim 1,
wherein the execution event is either an overflow or an underflow of a hardware counter.
9. (Previously Presented) The method of claim 1,
wherein the execution event triggers either an overflow or an underflow of a hardware counter that is itself detected.
10. (Original) The method of claim 1,
wherein the latency includes that associated with delivery of a trap.
11. (Original) The method of claim 1,
wherein the latency includes that associated with delivery of a counter overflow event signal.
12. (Original) The method of claim 1,
wherein the latency is associated with pipeline execution skid.
13. (Original) The method of claim 1,
wherein the latency is associated with completion of in-flight operations.
14. (Original) The method of claim 1, embodied in a computer program product.
15. (Original) The method of claim 1, embodied in at least one of:
a profiling tool;

a code optimizer; and
a runtime library.

16. (Original) The method of claim 1, employed in combination with a compiler that pads the code with one or more padding operations to absorb at least some instances of the latency.

17. (Original) The method of claim 16,
wherein the padding operations are not themselves associated with the execution event.

18. (Original) The method of claim 16,
wherein the padding operations are not themselves ambiguity creating locations.

19. (Currently Amended) A method of identifying operations associated with execution events of a processor, the method comprising:

from a point in an execution sequence of the operations of the processor, the point coinciding with an execution event, backtracking through the operations toward a particular operation that precedes the coinciding point by a displacement, wherein the displacement is based, at least in part on a type of operation appropriate for triggering the execution event latency; and

associating the execution event with the particular operation ~~unless the backtracking encounters an unresolved intervening target of a control transfer, wherein the predetermined latency is dependent upon the particular operation which is indicated by the execution event~~.

20. (Previously Presented) The method of claim 19, further comprising:
executing the sequence of operations on the processor; and
detecting the execution event.

21. (Previously Presented) The method of claim 19,
wherein the operations are instructions executable on the processor; and

wherein the particular operation is a particular one of the instructions that triggers the execution event.

22. (Previously Presented) The method of claim 19,
wherein the operations correspond to instructions of program code.

23. (Original) The method of claim 19,
wherein the execution event is an exception triggering execution of the particular operation.

24. (Original) The method of claim 19,
wherein the execution event is a cache miss.

25. (Previously Presented) The method of claim 19,
wherein the expected latency includes a trap delivery delay.

26. (Original) The method of claim 19,
wherein the execution event triggers a hardware event and the expected latency includes delivery of a signal associated therewith.

27. (Original) The method of claim 26,
wherein the hardware event is either underflow or overflow of a counter associated with the execution event.

28. (Original) The method of claim 19,
wherein the execution event is either underflow or overflow of a counter.

29. (Original) The method of claim 19,
wherein instances of intervening control transfer targets are identified in the execution sequence of operations to facilitate the backtracking.

30. (Original) The method of claim 29,

wherein at least some of the instances of intervening control transfer targets are resolved using branch history information.

31. (Original) The method of claim 19,

wherein control transfer target locations in the execution sequence are identified by a compiler.

32. – 36. (Cancelled)

37. (Currently Amended) The method of claim 19,

wherein the particular operation[[s]] comprises include a memory referencing instruction[[s]].

38. (Currently Amended) The method of claim 37,

wherein the memory referencing instruction[[s]] comprises include one or more of loads, stores and prefetches.

39. – 45. (Cancelled)

46. (Currently Amended) A method of preparing code for a processor, the method comprising:

preparing a tangible first executable instance of the code, the preparing identifying at least ambiguity creating locations therein;
executing the first executable instance and responsive to detection of an execution event characteristic, backtracking a predetermined displacement through the code to identify an associated operation thereof, wherein the displacement is based, at least in part, on a type of operation appropriate to have triggered the execution event extent of the backtracking is limited at least by encountering of an unresolved intervening one of the identified ambiguity creating locations, wherein the predetermined displacement is dependent upon the associated operation which is indicated by the execution characteristic; and

associating the operation with the execution event~~further preparing a tangible second executable instance of the code using the association between the associated operation and the execution characteristic.~~

47. (Previously Presented) The method of claim 46,
wherein the association between the associated operation and the execution characteristic
is based on a set of additional detections and responsive backtracking.

48. (Cancelled)

49. (Original) The method of claim 46, further comprising:
resolving at least some intervening ones of the identified ambiguity creating locations
using branch history information.

50. (Currently Amended) A computer program product encoded in one or more
computer readable media, the computer program product comprising:
an execution sequence of operations; and
one or more padding operations following a first at least some particular operation[[s]] of
the execution sequence, the padding operations providing an unambiguous skid
region of the execution sequence between the first at least some particular
operation[[s]] and a subsequent ambiguity creating location[[s]] to provide a
displacement predetermined latency between the ambiguity creating location[[s]]
and the first at least some particular operations to cover an expected detection
latency of the first operation facilitate determination of which of the at least some
particular operations are associated with execution events.

51. (Original) The computer program product of claim 50,
wherein the particular operations include memory access operations.

52. (Original) The computer program product of claim 50,
wherein the padding operations include nops.

53. (Original) The computer program product of claim 50,
wherein the unambiguous skid region does not include an ambiguity creating location.

54. (Previously Presented) The computer program product of claim 50,
wherein the one or more computer readable media are selected from the set of a disk,
tape, magnetic, optical, semiconductor or electronic storage medium and a
network, wireline, or wireless communications medium.

55. – 58. (Cancelled)

59. (Currently Amended) An apparatus comprising:
means for backtracking a predetermined displacement, from a point coinciding with an execution event in an execution sequence of operations on a processor, through the execution sequence toward a particular operation thereof that precedes the coinciding point, wherein the backtracking displacement is based, at least in part, on a type of the particular operation; and
means for associating the execution event with the particular operation ~~unless the backtracking encounters an intervening ambiguity creating location, wherein the predetermined displacement is dependent upon the particular operation which is indicated by the execution event~~.

60. (Original) The apparatus of claim 59, further comprising:
means for bridging at least some ambiguity creating locations.

61. (Currently Amended) An apparatus comprising:
a code preparation facility suitable for preparation of an execution sequence of operations for a processor; and
means for padding the execution sequence to provide an unambiguous skid region between a particular operation and a subsequent ambiguity creating location within the sequence of operations to cover an expected detection provide a predetermined latency, wherein the expected detection latency is based, at least in part, on a type of the particular operation between the ambiguity creating location

~~and the particular operation to facilitate determination of which of the sequence of operations is associated with an execution event.~~

62. (New) The method of claim 3, wherein the ambiguity creating location is bridged using branch history information.

63. (New) The method of claim 1 further comprising:
identifying the preceding operation and an ambiguity creating location subsequent to the identified preceding operation;
determining that an unambiguous interval between the ambiguity creating location and the identified operation is insufficient to cover an expected detection latency for the identified preceding operation; and
inserting padding operations, which provide at least a portion of a skid region between the identified preceding operation and the ambiguity creating location, into the code subsequent to the identified operation, wherein the expected detection latency is based, at least in part, on a type of the identified preceding operation.

64. (New) The method of claim 19 further comprising identifying target operations and ambiguity creating locations in the sequence of operations, wherein the identified target operations include the particular operation.

65. (New) The method of claim 64 further comprising ignoring a second execution event if an ambiguity creating location is encountered while backtracking.

66. (New) The method of claim 64 further comprising:
encountering an ambiguity creating location while backtracking; and
bridging the ambiguity creating location using branch history information.

67. (New) The method of claim 64 further comprising identifying ambiguity creating locations in the sequence of operations.

68. (New) The method of claim 67 further comprising inserting one or more padding operations into the sequence of operations between a first of the identified target operations and a first of the identified ambiguity creating locations to cover an expected detection latency of the first identified target operation.

69. (New) The method of claim 46, wherein the preparing comprises:
inserting one or more padding operations between the operation and a first of the identified ambiguity creating locations that is subsequent to the operation,
wherein the one or more padding operations provide at least a portion of a skid region between the operation and the first identified ambiguity creating location sufficient to cover an expected detection latency of the operation.